Articles

Watershed Protection: Problems and Possibilities

Judith Welch Wegner

For various reasons, including heightened development pressures, health concerns, and new federal and state regulations, many local governments are for the first time taking steps to protect their water supply. These steps usually include regulation of land use in the water supply watershed, and this regulation often crosses jurisdictional boundaries. This article describes the steps taken by representatives of Carrboro, Chapel Hill, and Orange County (N.C.) to improve the regulatory scheme governing the University Lake watershed. The article identifies four major problems encountered in this process, and provides valuable insights for jurisdictions facing similar challenges.

Watershed protection has become a matter of increasing concern to planners and elected officials in North Carolina and elsewhere. In recent years, existing water supplies have proved inadequate to serve public needs resulting from increased use of water and population growth. Even where existing supplies provide a sufficient volume of water, more intensive development nearby may lead to degradation of water quality. New reservoir sites have become more and more difficult to identify, as undeveloped sites convenient to high-quality water supplies and user populations become increasingly scarce. Scientific studies have demonstrated previously unknown health risks associated with levels of pollutant loading that may have been accepted without comment in the past, and federal regulation of the quality of drinking water supplies has become more comprehensive and more stringent.

North Carolina has also adopted more demanding requirements for water supply watershed protection, through the enactment in 1989 of House Bill 156 (G.S. 143-214.5), and adoption of accompanying regulations in December 1990. This legislation provides for a cooperative program of watershed management and protection to be administered by local governments consistent with minimum statewide management requirements. The state will continue to play a role in adopting rules for classification of water supply watersheds and protection of surface water supplies through minimum performance-based water supply watershed management requirements, but will have an enhanced role in administering and enforcing minimum statewide requirements if local governments fail to adopt a water supply watershed protection program or fail to carry out their enforcement responsibilities. Local governments must develop ordinances which comply with minimum state requirements and address land use activities, best management practices, development density controls, and structural stormwater controls, and submit such ordinances for review at the state level. If local governments fail to adopt programs that meet state requirements or fail to adequately administer and enforce the provisions of their programs, the state Environmental Management Commission may assume responsibility for water supply watershed protection.

As local governments, planners, elected officials, advisers to development interests, and members of the public prepare to meet the significant challenges posed by these recent developments, it is important to take stock of the problems likely to be confronted in the course of efforts to improve the protection afforded water supply watersheds, and to think creatively about possible solutions to those problems. This essay endeavors to do just that, drawing on the author's recent experience as a member of the Carrboro, North Carolina Board of Aldermen during a time in which representatives of Carrboro, Orange County and Chapel Hill sought to improve the regulatory scheme governing the University Lake watershed (which supplies drinking water to area residents) and her background as a teacher of local government and land use law. The essay first provides background about the University Lake watershed. It then analyzes four major problems encountered in the course of efforts to develop an appropriate regulatory scheme, and discusses the policy development process and possible solutions to those problems identified in connection with the University Lake experience. The essay concludes with suggestions for decisionmakers in other jurisdictions that may soon face similar challenges.

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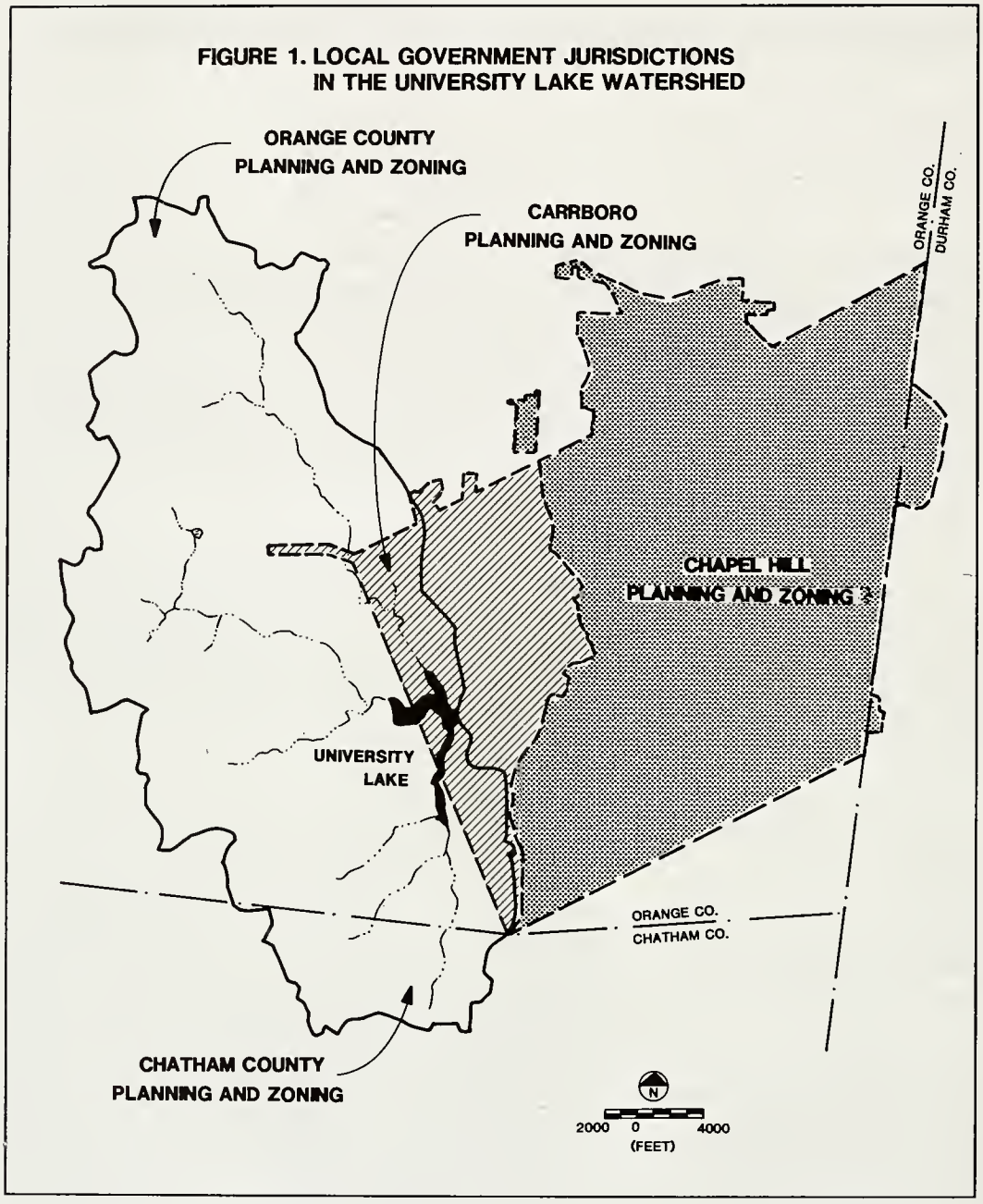

FIGURE 1. LOCAL GOVERNMENT JURISDICTIONS IN THE UNIVERSITY LAKE WATERSHED

The University Lake Watershed

The University Lake watershed is located in Orange and Chatham Counties. It is approximately 30 square miles in size. More than 95 percent of the watershed is privately owned. The watershed lies in three different political jurisdictions, with roughly 80 percent of the land falling under thority of Carrboro, and 10 percent under the authority of Chatham County (see Figure 1).

The University Lake reservoir was built in 1932. The reservoir is a major component of the water supply system that provides water for Chapel Hill, Carrboro, and parts of Orange County. The reservoir is managed by the Orange Water and Sewer Authority (OWASA), an independent authority governed by a nine-member board (five members appointed by Chapel Hill and two each by Carrboro and Orange County). OWASA provides water supply and wastewater services to approximately 60,000 residents of Carrboro, Chapel Hill, and Orange County. Fewer than 10 percent of the University Lake watershed's residents are consumers of University Lake water, however, and the nearly 1,850 households located in the University Lake watershed rely primarily on private wells and septic systems.

Questions concerning the adequacy of the area's water supply had been raised for a number of years as a result of increased water consumption, population growth, and summer drought conditions. OWASA began steps to develop an additional reservoir to supply necessary water. After a good deal of debate and litigation, construction began on the Cane Creek reservoir. This reservoir eventually came on line in 1988, increasing OWASA's raw water supply to 13.5 million gallons per day.

In the meantime, University Lake reservoir came under increasing pressure. In the early part of the decade, Orange County and Carrboro had implemented land use restrictions designed to protect the quality of the reservoir's water, by identifying a critical area near the lake, and imposing density restrictions (one and two acre lot sizes) and impervious surface limitations. By 1985 and 1986, however, development pressures had escalated, particularly with regard to land just to the west of Carrboro. Two significant residential subdivisions were proposed (one, Laurel Springs, was located in Orange County's jurisdiction, and the other, Amberly, in an area adjacent to Carrboro where annexation was requested). The Amberly project proved to be particularly controversial not only among Carrboro residents but also among

residents and elected officials of Chapel Hill and Orange County, due to its large size (215 acres and 177 units) and proposed reliance on public water and sewer services (which, if made available, would have to be authorized by OWASA). The debate over the Amberly project ultimately set the stage for more extensive discussion of water supply watershed management strategies, and led to the adoption of new land use regulations by Carrboro and Orange County in 1990 as well as related modification of OWASA policies during the same period.

"One of the most difficult aspects of resolving such a debate over the definition of the problem of watershed management is that each of the arguments advanced above has merit; each of these viewpoints is correct. If it is possible to proceed from this premise, rather than the premise that one or another viewpoint is correct and others are incorrect, a coordinated response to watershed management on a variety of levels may ultimately be achieved."

Problems and Pitfalls in Developing Regulatory Strategies

Planners and elected officials faced with a scenario such as that just described might well identify a number of concrete policy issues or considerations that should be considered in developing watershed management strategies. Soil and topographic conditions, hydrological data regarding water quality degradation and the impact of water quality on health and safety, population trends and economic projections, legal requirements and procedural prerequisites must all be taken into account. Certain other institutional problems and pitfalls may also have a dramatic effect on the ability of local governments to develop effective watershed management strategies. These institutional problems and pitfalls deserve special attention here because they may be encountered by many jurisdictions for the first time while preparing new watershed management policies.

1. Difficulty in Defining the Problem. Development of government policies in a wide variety of areas may require a careful diagnosis of surprisingly complex problems and an extensive search for suitable responses. For example, local governments' responses to the need for more affordable housing, a revitalized downtown, or improved relations between the police force and the community may require thoughtful examination and understanding of a variety of viewpoints and the creation of multi-faceted solutions. Perhaps more than in these other settings, however, there may be significant difficulties in defining the problem of watershed protection and watershed management, as well as in diagnosing the problem and finding suitable solutions.

Watershed management problems tend to exist at a variety of different levels simultaneously. A given jurisdiction may face a very concrete question whether to approve a conditional use permit or rezoning request for a particular development project. That jurisdiction may therefore define the problem as one of reaching an appropriate resolution with regard to the given project within the context of existing regulations. At the same time, however, the project may stimulate questions regarding the adequacy of the jurisdiction's existing regulatory scheme for protecting water quality within the specific watershed in question; the adequacy of its overall regulatory scheme for other watersheds within its control; the relation between regulatory goals such as the protection of water quality and the promotion of affordable housing or farmland preservation; its obligations to protect the quality of water supplies that may serve other jurisdictions; and the adequacy of the regulatory schemes in effect in other jurisdictions that lie within the same or nearby watersheds.

Different participants in discussions concerning the development of an appropriate watershed management strategy may favor different definitions of the problem at hand for a variety of reasons. For example, it may well be argued that for reasons of fairness, existing regulations should be applied to resolving a pending permit or rezoning request. At the same time, it may be contended that a particular development proposal raises more fundamental questions that must be addressed on one of the larger scales just described. Yet again, definition of the problem on an area-wide scale at the outset may well mean that a prompt resolution of the debate on possible solutions proves impossible, in light of the difficult coordination problems raised and the increased potential for impasse.

Which definition of the problem is the correct one--one of those just sketched, or others that might be imagined? One of the most difficult aspects of resolving such a debate over the definition of the problem of watershed management is that each of the arguments advanced above has merit; each of these viewpoints is correct. If it is possible to proceed from this premise, rather than the premise that one or another viewpoint is correct and others are incorrect, a coordinated response to watershed management on a variety of levels may ultimately be achieved. If, instead, the debate stalls over which viewpoint is the correct one, the confusion may be compounded and little progress made toward common goals.

2. Problems in Developing an Adequate Information Base. As noted above, planners and elected officials generally recognize the need to develop an appropriate information base before reaching important public policy decisions. There are, however, special pitfalls in reaching this objective in connection with the development of watershed management policies.

There are at least three dimensions to the information base that is needed in reaching sound watershed management decisions. Information is needed concerning factors generally considered in the development of land use policies; those that relate to environmental health and science and more technical engineering issues; and those that relate to balancing the concerns of different segments of the community (often described as "political" in character). In a particular jurisdiction, information may be unavailable relating to one or another of these dimensions, or, if available, may not be shared by all those involved in development of watershed management policies. Conflicts can therefore arise unless a more adequate, shared information base is developed.

"At the outset, it is important to recognize that "politics" is not a dirty word; it is all too easy to describe the view of one segment of the community as "political" while treating that of another segment as legitimate and sacrosanct. An assessment of political realities can and should represent a careful evaluation of the viewpoints of differing segments of the community, and the bases for those views --whether they be economic, historical, or psychological."

Traditionally, local jurisdictions have staff with expertise in land use planning, often derived through a combination of formal education and practical experience. Such individuals may be skilled in addressing the problems of urban and suburban populations, or (in jurisdictions with less developed land) in responding to the difficulties faced by more rural populations; however, they frequently do not have experience in both areas. Moreover, planners who have been on staff for quite some time may lack insight into or confidence in newer strategies for land use management within transitional or environmentally sensitive areas, may lack training in communications and dispute resolution skills that are helpful in dealing with diverse populations, or may have developed relatively inflexible judgments concerning the importance of competing policy considerations as they affect a given community or group of communities. Finally, due to continuing financial stringencies throughout the public sector, planning departments may be understaffed or may experience repeated turnover of personnel, making it difficult to allocate staff time toward development of a comprehensive information base regarding watershed management, in light of the press of urgent business in other areas.

Depending on the jurisdiction, more or less technical information regarding health and safety and engineering issues related to water quality may be available. Limitations on staff background and experience such as those outlined above may also exist with regard to those staff members responsible for managing an area's water supply, particularly if such staff have limited training and responsibility for land use planning issues, just as planning staffs often lack training and expertise regarding engineering issues. While additional expertise may be available through contact with regional councils of government or separate water and sewer authorities in an area, or through contracts or consulting relations with trained engineers, contact between government staffs and elected officials, and others with specialized expertise may be infrequent and may not be enough to develop a strong and lasting information base.

In addition, it must be borne in mind that efforts to protect drinking water watersheds continue to require analysis and information-gathering at the cutting edge of environmental science and engineering. As scientific studies continue to be undertaken, understanding of the relationship between water quality and nearby development is likely to increase. Nonetheless, reliance on projections and computer modeling will continue to be required in order to identify the potential for future problems and to head them off before they arise. Analysis must also take into account the significant differences between individual watersheds, including those that arise because of variations in soil types, topography, reservoir characteristics, tributary systems, meteorological conditions, existing patterns of development, and other significant variables. In addition, it is important to recognize that technically sophisticated analysis and information of this type often may not be easily digested by all members of the community (whether they are elected officials or citizens), in light of the unfamiliar terminology and concepts typically used to communicate relevant findings.

Finally, information is needed concerning the political realities at work in given jurisdictions. At the outset, it is important to recognize that "politics" is not a dirty word; it is all too easy to describe the view of one segment of the community as "political" while treating that of another segment as legitimate and sacrosanct. An assessment of political realities can and should represent a careful evaluation of the viewpoints of differing segments of the community, and the bases for those views--whether they are economic, historical, or psychological. Moreover, it is important to recognize that economic, historical, and psychological considerations are likely to operate with regard to each segment of the community, not just some.

For example, urban or suburban water users who do not live within a regulated watershed may strongly favor stringent watershed regulation for reasons quite apart from health and safety considerations: they often would prefer not to pay the cost of purchasing additional land for the purpose of protecting an existing or future reservoir; they

may traditionally have looked down on more rural residents as less educated or politically powerful; and they may be both more aware or more fearful of potential health risks, less used to accepting unwelcome change within their environment without protest, and more inclined to retain the size and character of the community as it exists rather than allowing an additional influx of population that may arise if stringent land use controls are not imposed. On the other hand, more rural residents who live in water supply watersheds may reasonably fear that stringent regulations will result in decreased land values (foreclosing an opportunity for needed agricultural financing or retirement support); believe that watershed regulation efforts represent just one more in a series of efforts by suburban political powers to impose burdens without providing offsetting benefits; and conclude that their ability to control their own destinies and to manage property long held in their families is threatened without adequate reason by those who have not had to exercise careful stewardship of the land. These political realities may not be understood by all elected officials or government staff. If they are ignored or lightly dismissed, without being understood as part of a shared information base, irreparable controversy and unsound policy judgments are likely to result.

"Three major shortcomings of the existing legal system are worth special note. First, the substantive legal principles for resolving disputes are, in a number of relevant respects, simply incomplete or unclear. . . . In addition, the existing legal system lacks flexibility. . . . Finally, the legal system does not provide for effective collaboration among affected parties, decisionmakers and jurisdictions."

3. Inadequacy of Traditional Decision-Making Processes. The procedural and substantive requirements that govern adoption of regulations and related decisions by local governments are generally well known and reasonably well understood by planners and local government officials. Local governments must have adequate authority to undertake various sorts of initiatives, and they must operate within statutory and constitutional bounds. Where rezoning, permitting, annexation, or land use ordinance revisions are concerned, federal and state constitutions, state statutes, judicial decisions, and local ordinances generally prescribe basic contours concerning what may and may not be done. Certain key decision points are thereby identified as a matter of law; procedural requirements for notice and hearings are specified; voting requirements applicable to relevant governmental entities are stated; mandates for open meetings are imposed; and standards for judicial review in the event of an appeal are delineated. While the legal framework just described also has significant bearing on the development of management strategies for drinking water watersheds, it is unfortunately not always well suited in and of itself for facilitating the development of sound policy decisions relating to watershed management.

Three major shortcomings of the existing legal system are worth special note. First, the substantive legal principles for resolving disputes are, in a number of relevant respects, simply incomplete or unclear. In an area such as watershed management where novel strategies may be needed to reach public policy goals, statutory authority may not yet exist to ensure that certain sorts of regulatory tools or expenditures of public funds can be undertaken without challenge. The process of statutory reform may be slow and difficult, particularly if one or another segment of the community prefers the status quo and opposes legislative action. In addition, some of the most significant legal doctrines that may come into play in the event of appeals from governmental action are notoriously ambiguous. Traditional doctrine designed to address conflicting land uses (such as the law of nuisance) involves a careful fact-oriented balancing process whose outcome can be difficult to predict. The development of constitutional "taking" doctrine as a means for preventing excessive regulation by governmental entities has become increasingly unclear over the past several years, as the United States Supreme Court has rendered numerous split decisions and made a number of confusing distinctions concerning the weight to be afforded certain sorts of governmental purposes, the need for close relationships between governmental purposes and the regulatory scheme employed, procedural requirements that must be satisfied, and the availability of a compensation remedy in certain exceptional cases.

In addition, the existing legal system lacks flexibility. It is designed to ensure that decisions are reached at appropriate check points, rather than to encourage the compilation of adequate information over an extended period. It tends to sanction win-lose resolutions following expensive judicial appeals, rather than to facilitate development of win-win solutions designed to accommodate diverse competing interests following extensive informal consultation. It provides few opportunities for give and take, the raising of questions and provision of answers by a wide range of citizens, government officials and staff, and the sort of frank discussion (at times off the record) and brainstorming that may be needed to develop sound policies.

Finally, the legal system, as it is now constituted, does not provide for effective collaboration among affected parties, decisionmakers and jurisdictions. The formality of the decision-making process just noted has as its flip side the relative absence of established frameworks for informal

collaborative interchange among citizens, staff and elected officials. Governing boards are expected (and wish) to preserve their autonomy and decision-making power, and may curb informal discussions with any given citizen group or interest in order to ensure that no one group or interest has undue influence. Hearings are inefficient methods for gathering useful insight into very complex issues, since they often come far along in the decision-making process after draft proposals have been developed, result in contentious debates once tempers have flared, and provide only limited time for submission of brief formal comments. When multiple jurisdictions are involved in regulating within a given watershed, difficulties are compounded, since there is generally no established forum for discussion on an intensive basis between affected officials, press reports may provide a limited or incorrect portrayal of related events, and there may be a history of difficulties in communication or distrust between relevant officials or governments. In addition, staff may feel obliged to focus only on their jurisdiction's independent interest rather than on cooperative solutions in the interest of the area as a whole. It may also be difficult to coordinate differing decision-making processes of several jurisdictions that involve unique traditions, ordinance provisions, and advisory boards.

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4. Difficulties in Creating Effective Solutions. Solutions to watershed management dilemmas may well be more difficult to develop than those in other settings for many of the reasons noted above. There is as yet only a limited track record of strategies that have proved effective in this context. As a result, many jurisdictions (and their planners and elected officials) may need to invent solutions for themselves, rather than being able to rely on examples from elsewhere or from their own past experience. Solutions may, in any event, need to be relatively unique, in light of the differing characteristics of watersheds, reservoirs, established ordinance structures, and relevant political concerns. They may need to be unusually comprehensive, involving not only novel forms of land use controls, but also engineering requirements, expenditures of funds for land acquisition, additions to inspection staffs, and coordination of farmland preservation and affordable housing initiatives. They may also arise only after heated debate leaves the community deeply divided and lacking in common ground, and it may be difficult in such circumstances to develop a constituency for a middle course rather than one or another win-lose solution. Solutions may also require the collaboration of several different area jurisdictions, but at the same time entail careful coordination rather than adoption of identical strategies. A balance of complementary skills, willingness to learn, and mutual respect on the part of staff and elected policymakers may be critical. The necessity for technical expertise, creative insight, trust, and respect for others' viewpoints and autonomy may be more than many jurisdictions can muster without careful preparation and thought.

One Area's Response

The experience of area governments in addressing the need for improved management strategies within the University Lake watershed not only yielded insight into the existence of the difficulties just described, but also resulted in some effective and creative responses to these dilemmas. Because planners and elected officials in other jurisdictions may find it useful to draw upon the University Lake watershed experience in formulating their own responses to these difficulties, it is worth describing that experience in more detail here.

1. Defining the Problem. Carrboro, Chapel Hill and Orange County officials were able to finesse the difficulties of defining the problem of watershed management by proceeding on several different tracks.

Although steps had been taken earlier in the decade by Carrboro and Orange County to adopt land use regulations that would ensure adequate protection for the University Lake watershed, a major re-examination of the watershed management problem came about as a result of a private developer's proposal for construction of the Amberly project in 1986. Carrboro initially attempted to develop a sound response to the issues presented by the project (including the appropriate level of density restrictions, the availability of cluster rather than large-lot development, access to public water and sewer, and application of appropriate buffer and road location requirements). The matter remained under consideration for more than a year, during most of 1986 and part of 1987. Debate within the Carrboro Board of Aldermen also focused on whether the project should be considered within the terms of existing or revised regulations, the extent of discretion in reaching annexation and rezoning decisions, and the obligations of OWASA to provide public water and sewer if Carrboro officials concluded that the provision of public sewer service was more

environmentally safe than reliance on septic systems that could potentially fail. The debate at times became acrimonious, resulting in an initial decision by a board split 3-4 not to approve the project, a later decision by a vote of 4-3 to approve the project, litigation by both opponents of the project and the developer challenging board decisions, and significant changes in the membership of the board after a bitterly contested election marred by innuendo.

Efforts to address the problem of University Lake watershed management also proceeded on several additional fronts during this period and the years that followed, however. Officials from Carrboro, Chapel Hill and Orange County had in prior years discussed strategies for joint land use planning within the southern part of Orange County, after Chapel Hill's request for extended extraterritorial jurisdiction had been rejected by Orange County. The joint planning discussions had not gained significant momentum, however, until the Amberly controversy proved a catalyst for resolution of a number of interrelated planning issues, including the issue of watershed protection. A work group of representatives from the Carrboro Board of Aldermen, Chapel Hill Town Council, and Orange County Board of Commissioners convened and met on a weekly basis during the fall and winter of 1986-87, seeking to develop an agreement in principle that would resolve key issues that had prevented adoption of a joint planning scheme. The result was a brief multi-faceted proposal which described areas of concurrent authority for the two towns and the county, established a rural buffer/greenbelt which would not receive public water and sewer and would not be subject to annexation for a number of years, and which recognized that the governments continued to disagree about the response to be made to the Amberly proposal (acknowledging that Carrboro would ultimately have to resolve that matter on its own, while taking into account the views of adjacent jurisdictions). The agreement in principle also contemplated that OWASA would commission a major study of the University Lake watershed, in order to provide the necessary information base for subsequent review of Carrboro and Orange County ordinances and OWASA policies. The ability to reach agreement on these matters provided an important foundation that stimulated trust and willingness of the area jurisdictions to continue to work together on watershed policy development in the ensuing years.

The University Lake watershed study was completed in 1989, as discussed in more detail below. Again, the three jurisdictions had to work together to define the precise watershed management problem to be addressed at the next stage of policy development. Although discussions continued regarding whether other water supply watersheds in the area should also be subject to policies developed with an eye toward the University Lake watershed, the interjurisdictional work group that proposed strategies for University Lake watershed management ultimately concentrated its attention and recommendations on the University Lake area, rather than venturing farther afield to include the distinctive Cane Creek watershed and other water supply watersheds in the northern part of Orange County, as some members had urged.

2. Developing an Information Base. The University Lake watershed study just mentioned, undertaken by Camp, Dresser and McKee pursuant to a contract with OWASA, provided critical technical information on the University Lake watershed. The study was commissioned by OWASA, upon agreement by the affected jurisdictions to defer further action regarding watershed management regulations until more information could be gathered. The study included an inventory of the watershed (concerning existing land use, soils, topography, and hydrology), an estimate of nonpoint pollutant loading, the creation of five alternative development scenarios for the watershed (including existing local land use plans, one-acre residential zoning, five-acre residential zoning, variable density cluster development, and high density urban development), the use of a pollutant loading/reservoir model to predict the water quality effects of each scenario, and watershed management recommendations. Both a technical advisory committee and an advisory committee composed of government officials were appointed to provide additional advice and gain additional information during the course of the study, but these committees were used only to a limited extent. The consultants did, however, hold public meetings to describe the study methodology and preliminary findings along the way.

The consultants ultimately developed a model that they believed would be useful in projecting pollutant loading under the various development scenarios described, recommended a goal of preventing significant future deterioration of water quality, focused on total phosphorus and chlorophyll *a* concentrations as indicators of pollutant loadings, identified structural and nonstructural strategies for achieving the goal of minimal degradation, discussed the costs and risks associated with structural strategies such as use of wet detention ponds, and recommended nonstructural strategies including use of large lot (five acre) residential zoning, a four percent impervious surface limitation, and preservation of vegetated buffers. They also recommended adoption of conventional septic systems rather than community systems or public sewer systems at least where strict controls on size and capacity would not be sufficient to overcome pressures for more intensive development.

While the Camp, Dresser and McKee study did a great deal to expand the technical information base, it did not attempt to address the full range of land use planning issues posed by watershed management initiatives, and the difficult questions related to the diverse concerns of various political constituencies. It also in and of itself provided no mechanisms for bringing about dialogue and understand-

ing between citizens, planners, those with technical expertise, and elected officials from the area's jurisdictions.

Subsequently, in the summer of 1989, representatives of the elected boards of Orange County, Carrboro, and Chapel Hill convened for discussions concerning how to respond to the study's recommendations. An intergovernmental committee created to address planning, water, transportation and related issues in Orange and Chatham Counties had been established a year earlier, and provided an available and effective vehicle for discussions among elected officials who had already become reasonably comfortable in working together. The intergovernmental committee was assisted by a working group of staff members from Orange County, Carrboro, Chapel Hill, the Triangle J Council of Governments, and OWASA. Through intensive meetings every week or two during late August, September, and October 1989, the committee of elected officials, along with the committee of professional staff, were able to discuss at some length the Camp, Dresser and McKee findings and recommendations, as well as to develop additional information concerning planning issues, address questions related to the impact on land values of stringent density constraints, and identify significant historical and emotional issues that underlie the political differences between constituents in various areas. Of particular importance was the forthright discussion of disagreements concerning the allocation of benefits and burdens associated with the regulations (should water users be obliged to pay compensation to landowners subject to stringent regulatory constraints, or should landowners be obliged to refrain from development that might adversely affect water users?), the strong sense of inequitable treatment and historical grievances concerning the area's school system and economic development that continued to trouble rural landowners (but had been relatively invisible to residents of the towns), and the potential stake that all members of the community had in trying to develop a mutually agreeable solution. These concerns might initially have been dismissed as "political" in nature by certain of the area's leaders, but by the concluding phases of the discussion they were understood to be significant, legitimate, and very real.

3. Creating an Appropriate Decision-Making Process. The process for developing sound management strategies for University Lake watershed relied both upon legally-mandated mechanisms for reaching governmental decisions, and upon more informal mechanisms designed to supplement the decision-making process. The affected governments continued to comply with requirements concerning notice, hearing, permitting and rezoning requirements, and requests for special legislation to authorize novel mechanisms for cooperative planning and unusual means of land use control. Indeed, the uncertainties associated with legal doctrine and potential litigation at times increased the pressure for development of balanced, well-justified solutions that took into account the many viewpoints expressed over the several years of community discussions concerning the most appropriate management strategies for University Lake watershed.

On the other hand, the informal processes used in developing a strategy for University Lake watershed management contributed in significant ways to the development of a better understanding of the problem and the development of more satisfactory solutions. As noted above, a multi-stage process was used in defining the problem and addressing it on several levels, including not only the project-specific level, but also the watershed-wide level, and the area-wide level (insofar as it was necessary to take into account other related issues such as the need to identify non-watershed areas as focal points for residential and commercial growth, and to specifically address the problems of rural character in non-watershed areas of the county). In addition, a more flexible and collaborative process allowed elected officials and staff members to gather and pool information, identify common goals, flag areas where consensus was lacking for further discussion and exploration, identify areas of ultimate agreement, brainstorm about possible solutions, and respectfully disagree where agreement could ultimately not be reached.

That is not to say that there were no flaws in the process used. Although the meetings of the intergovernmental group that ultimately developed recommendations to area jurisdictions were open to the public, and comments from members of the audience were invited and welcomed at meetings, some citizens may have felt that they would have liked more formal opportunities for providing comments during this process, or may have concluded that this process of discussions among staff and elected officials did not provide an adequate role for landowners and other interested citizens before momentum grew in support of some sort of collaborative solution. In addition, a significant effort was needed to provide adequate information to all interested members of the public, a goal that was partially, but not completely, achieved. Members of the staffs of area jurisdictions and some members of governing boards also felt constrained late in the process to raise questions or recommend changes in certain facets of the compromise developed by the intergovernmental work group, in order to address specific concerns raised by constituents or problems that they believed were not adequately taken into account by the compromise proposal. Finally, an ideal solution would have been one supported by all members of the community. Despite efforts to develop a compromise that would take into account the full range of concerns among water users, landowners, and others, feelings still ran high at the time of hearings concerning proposed watershed management regulations, and a sense of division between those benefited and those burdened by such regulations remained.

Nonetheless, the use of a more flexible process that provided for informal gathering of information, discussions

among staff and elected officials, and development of a compromise designed to help local governments develop necessary regulatory provisions in a coordinated and timely fashion contributed significantly to the adoption of a careful, balanced, and sophisticated set of watershed management policies in a relatively short time. The substance of those regulations and related measures taken by area governments and OWASA is outlined below.

4. Creating Effective Solutions. The creation of an effective solution for University Lake watershed was helped significantly by the steps outlined above (developing a multi-faceted definition of the problem, creating a sound and comprehensive information base, and developing a more flexible, collaborative decision-making process). Important lessons can also be learned from the substance of the solutions ultimately adopted.

The basic Camp, Dresser and McKee recommendation of five-acre minimum lot sizes with private septic systems was ultimately adopted by both Orange County and Carrboro, with certain modifications. Among the most significant modifications was the recognition that existing lots of record could be subdivided so as to create not only large lots of five acres or more in size, but also a small number of lots between two and five acres in size in order to mitigate the hardship feared by landowners. An option for cluster development was also permitted (provided that stringent impervious surface limitations were satisfied, structural stormwater control mechanisms were implemented in appropriate cases, a one-acre minimum lot size was observed, an overall density of no more than one unit per five acres was satisfied, and septic systems rather than community systems were utilized). Orange County and Carrboro ultimately disagreed on the appropriate level of impervious surface controls to be applied to land within their respective jurisdictions, with Carrboro preferring a four percent impervious surface limitation for lots of five acres or more, and six percent for lots between two and five acres; and Orange County adopting a sliding scale of impervious limits with a maximum of six percent for five-acre lots and a maximum of twelve percent for two-acre lots. Vegetative buffers were mandated, controls on lot placement and siting of structures specified, and other regulatory requirements adopted.

In addition, a number of other policies related to watershed management were identified for future consideration by area jurisdictions and OWASA. Orange County planned to pursue the development of strategies for dealing with special hardships that might be suffered by farmers, and OWASA agreed to create a watershed protection fund to acquire fee simple title or development rights in particularly sensitive land within the watershed. OWASA also adopted a policy of generally prohibiting extension of public water and sewer into the University Lake watershed, and continued its extensive water quality monitoring program.

Conclusion

The University Lake story is intended only to provide a starting point, not an ending point, for discussion of strategies for watershed management. The lessons learned by those who sought to develop a solution for the University Lake watershed were many--including the need to define the scope of watershed problems carefully; the importance of a shared information base including both technical, planning and political information; the usefulness of flexible, collaborative decision-making processes that can supplement traditional legally-mandated decision-making mechanisms; and the possibilities for creative solutions that take into account the diverse concerns and many variables involved in development of watershed management policies.

A number of the government officials, university professors, and staff involved in the University Lake watershed negotiations believe that it is possible to learn how to work more effectively in solving such difficult problems. To that end, your help is requested. It would be very useful to learn of your own stories about dealing with difficult watershed management issues, so that we could develop a set of detailed case studies to be shared with other jurisdictions that are about to commence their own journey through uncharted waters. In addition, we hope to develop a detailed simulation exercise, based on the University Lake experience, for use by staff and government officials who would like to gain experience with a "dry run" involving watershed management issues before embarking on their own real life adventures. To make such an experience most meaningful, we would like to develop such an exercise in conjunction with staff and elected officials in other jurisdictions who might consider participating in such an exercise at no or minimal cost. If either of these ideas interests you, please contact the author at the University of North Carolina School of Law, CB 3380, Chapel Hill, N.C. 27599, or phone (919) 962-4417. □

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